The Electricity System in Sweden and Northern Europe

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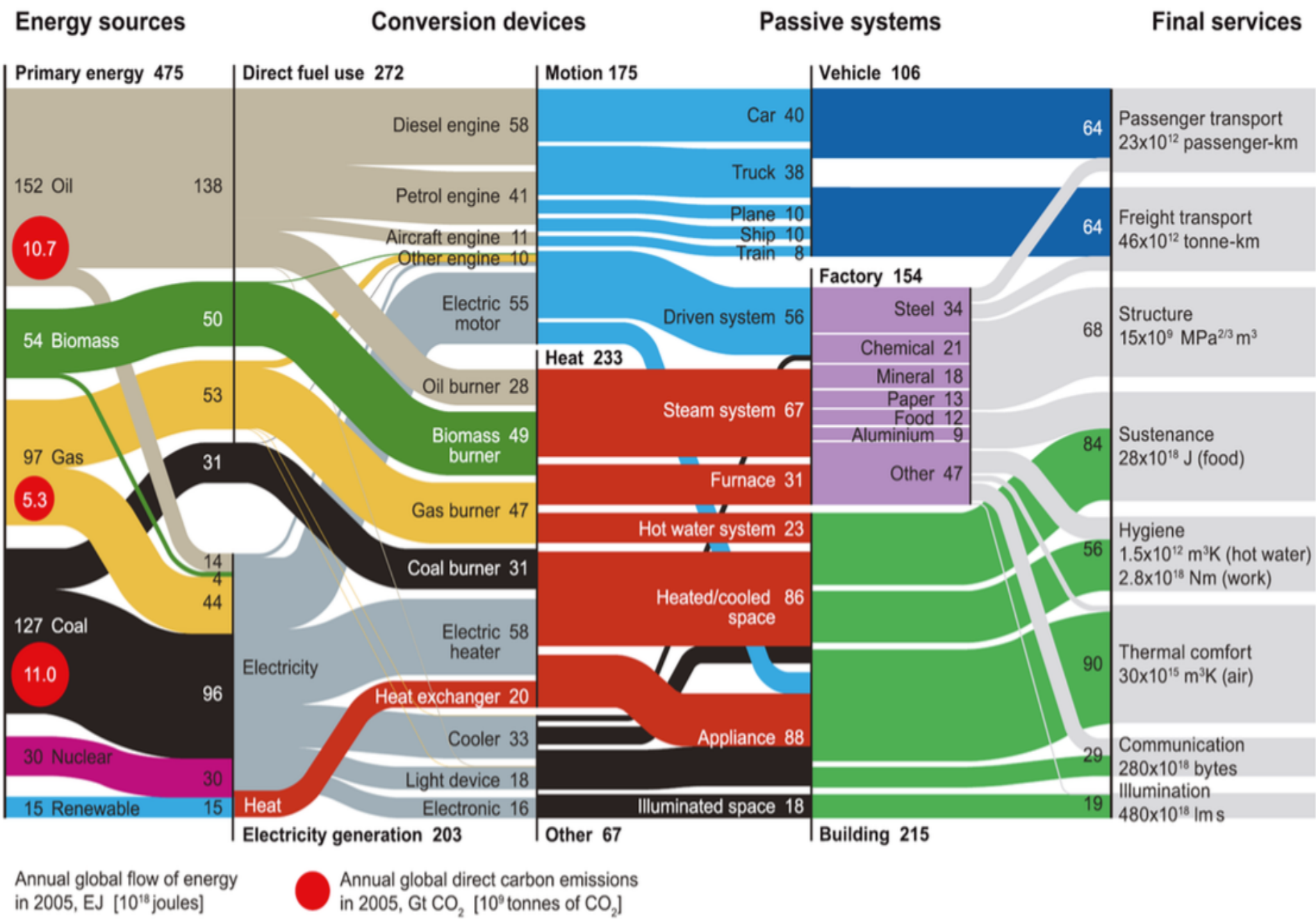


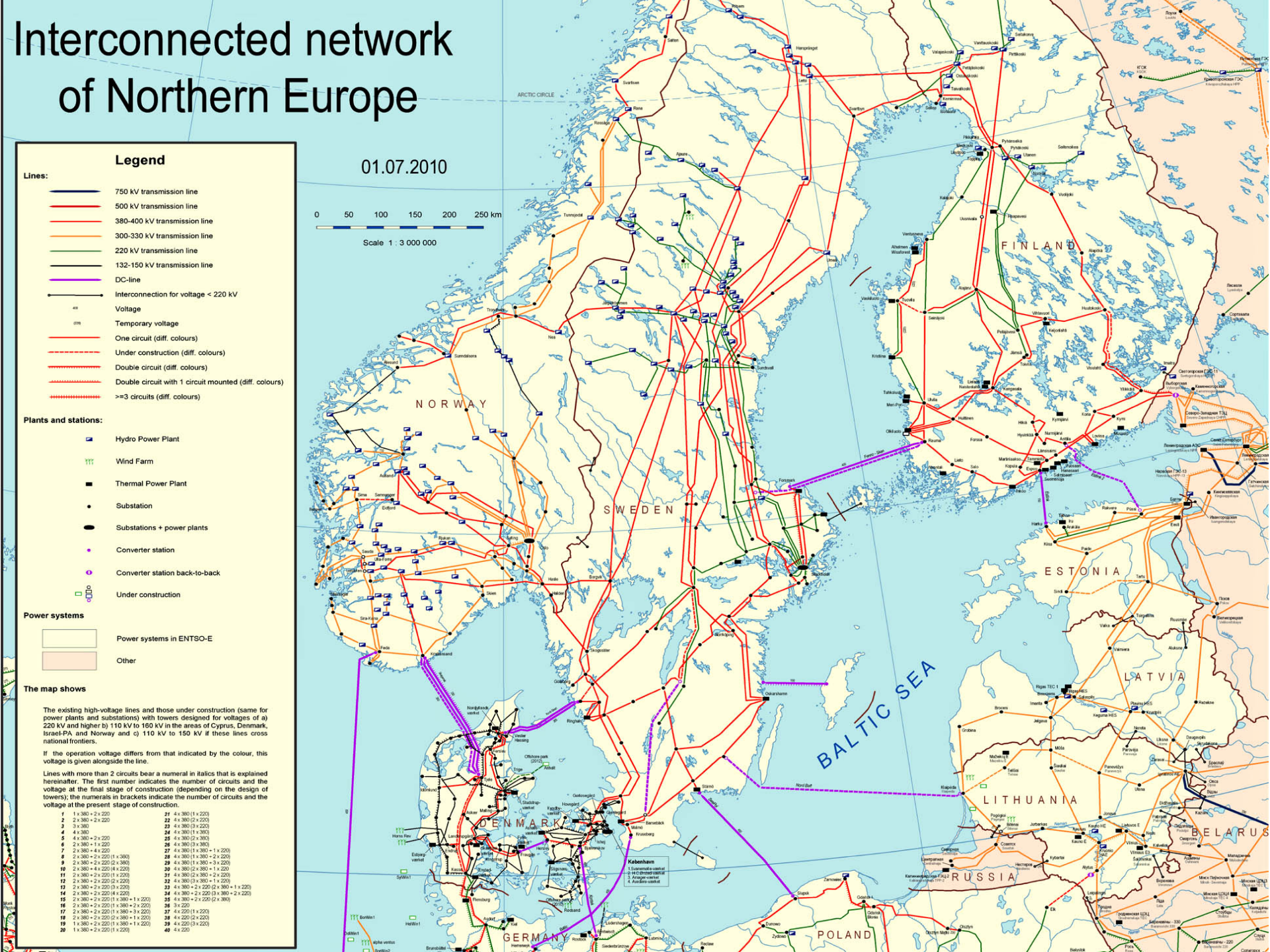
Source: Jonathan M. Cullen, Julian M. Allwood, 2009.
"The efficient use of energy: Tracing the global flow of energy from fuel to service". Energy Policy

Annual electricity production in Sweden

In both residential & service sector AND industry it is **electricity** that is the **dominant energy carrier**

- Hydropower ~40%
- Nuclear ~40%
- Wind ~10%
- CHP ~10%

Interconnected network of Northern Europe



Legend

Lines:

- 750 kV transmission line
- 500 kV transmission line
- 380-400 kV transmission line
- 300-330 kV transmission line
- 220 kV transmission line
- 132-150 kV transmission line
- DC-line
- Interconnection for voltage < 220 kV
- Voltage
- Temporary voltage
- One circuit (diff. colours)
- Under construction (diff. colours)
- Double circuit (diff. colours)
- Double circuit with 1 circuit mounted (diff. colours)
- >=3 circuits (diff. colours)

Plants and stations:

- Hydro Power Plant
- Wind Farm
- Thermal Power Plant
- Substation
- Substations + power plants
- Converter station
- Converter station back-to-back
- Under construction

Power systems

- Power systems in ENTSO-E
- Other

The map shows

The existing high-voltage lines and those under construction (same for power plants and substations) with towers designed for voltages of a) 220 kV and higher b) 110 kV to 160 kV in the areas of Cyprus, Denmark, Israel-PA and Norway and c) 110 kV to 150 kV if these lines cross national frontiers.

If the operation voltage differs from that indicated by the colour, this voltage is given alongside the line.

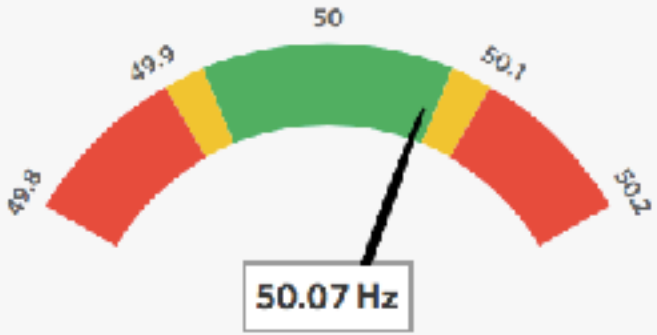
Lines with more than 2 circuits bear a numeral in italics that is explained hereinafter. The first number indicates the number of circuits and the voltage at the final stage of construction (depending on the design of towers); the numerals in brackets indicate the number of circuits and the voltage at the present stage of construction.

1	1 x 380 + 2 x 220	*21*	4 x 380 (1 x 220)
2	2 x 380 + 2 x 220	*22*	4 x 380 (2 x 220)
3	3 x 380	*23*	4 x 380 (3 x 220)
4	4 x 380	*24*	4 x 380 (1 x 380)
5	4 x 380 + 2 x 220	*25*	4 x 380 (2 x 380)
6	2 x 380 + 1 x 220	*26*	4 x 380 (3 x 380)
7	2 x 380 + 4 x 220	*27*	4 x 380 (1 x 380 + 1 x 220)
8	2 x 380 + 2 x 220 (1 x 380)	*28*	4 x 380 (1 x 380 + 2 x 220)
9	2 x 380 + 2 x 220 (2 x 380)	*29*	4 x 380 (1 x 380 + 3 x 220)
10	2 x 380 + 2 x 220 (4 x 220)	*30*	4 x 380 (2 x 380 + 1 x 220)
11	2 x 380 + 2 x 220 (1 x 220)	*31*	4 x 380 (2 x 380 + 2 x 220)
12	2 x 380 + 2 x 220 (2 x 220)	*32*	4 x 380 (3 x 380 + 1 x 220)
13	2 x 380 + 2 x 220 (3 x 220)	*33*	4 x 380 + 2 x 220 (2 x 380 + 1 x 220)
14	2 x 380 + 2 x 220 (4 x 220)	*34*	4 x 380 + 2 x 220 (3 x 380 + 2 x 220)
15	2 x 380 + 2 x 220 (1 x 380 + 1 x 220)	*35*	4 x 380 + 2 x 220 (2 x 380)
16	2 x 380 + 2 x 220 (1 x 380 + 2 x 220)	*36*	3 x 220
17	2 x 380 + 2 x 220 (1 x 380 + 3 x 220)	*37*	4 x 220 (1 x 220)
18	2 x 380 + 2 x 220 (2 x 380 + 1 x 220)	*38*	4 x 220 (2 x 220)
19	1 x 380 + 2 x 220 (1 x 380 + 1 x 220)	*39*	4 x 220 (3 x 220)
20	1 x 380 + 2 x 220 (1 x 220)	*40*	4 x 220

Balans

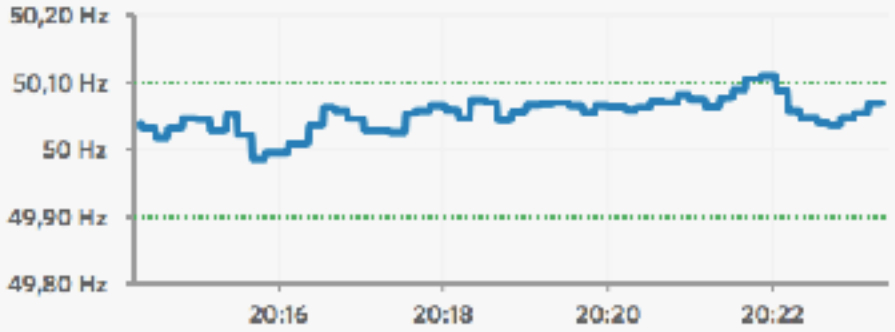
För att elsystemet ska fungera måste det hela tiden vara balans mellan produktion och förbrukning av el. Frekvensen i elsystemet är ett mått på det och ska vara 50 Hz.

Aktuell frekvens

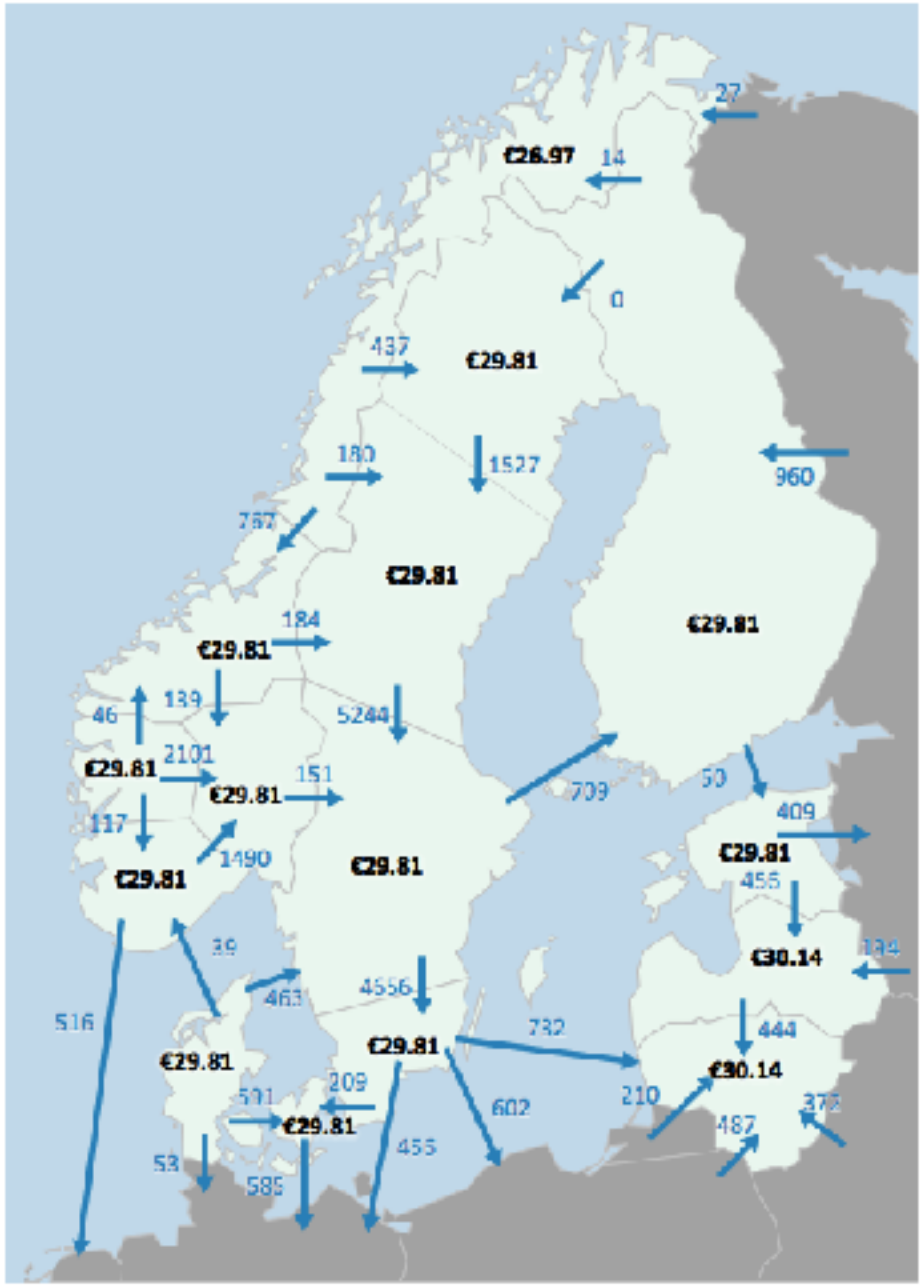


Frekvensen är ett mått på och resultat av hur väl produktion och användning av el är i balans. Frekvensen ska vara 50 Hz (Hertz). Då råder det balans mellan produktion och förbrukning. Om förbrukningen är högre än produktionen sjunker frekvensen; om produktionen är högre än förbrukningen stiger frekvensen.

Senaste 15 minuterna



Balansen regleras både automatisk i systemet och manuellt genom olika verktyg för produktions- och förbrukningsreglering för att hålla frekvensen på 50 Hz.



Flöden uppdaterade idag 20:27
Priser uppdaterade idag 20:00

Total export / import

Exporterar

SVERIGE
2 087 MW

Exporterar

DANMARK
952 MW

Exporterar

NORGE
1 190 MW

Importerar

FINLAND
1 987 MW

Exporterar

ESTLAND
817 MW

Importerar

LETTLAND
215 MW

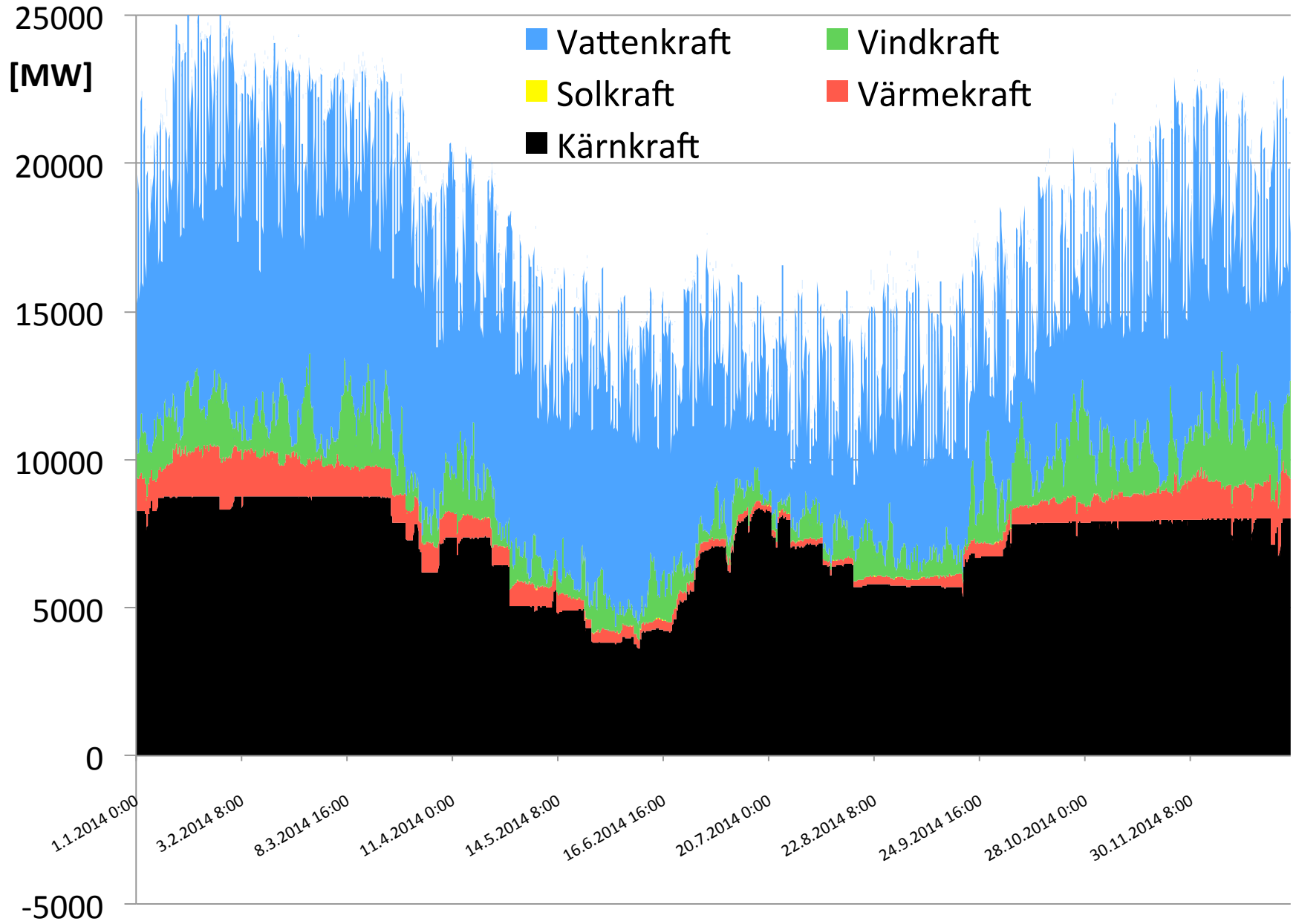
When you switch on a light bulb in Stockholm

Instantaneous change: All synchronous generators in the grid spins a little slower, but due to their inertia they counteract the instantaneous change..

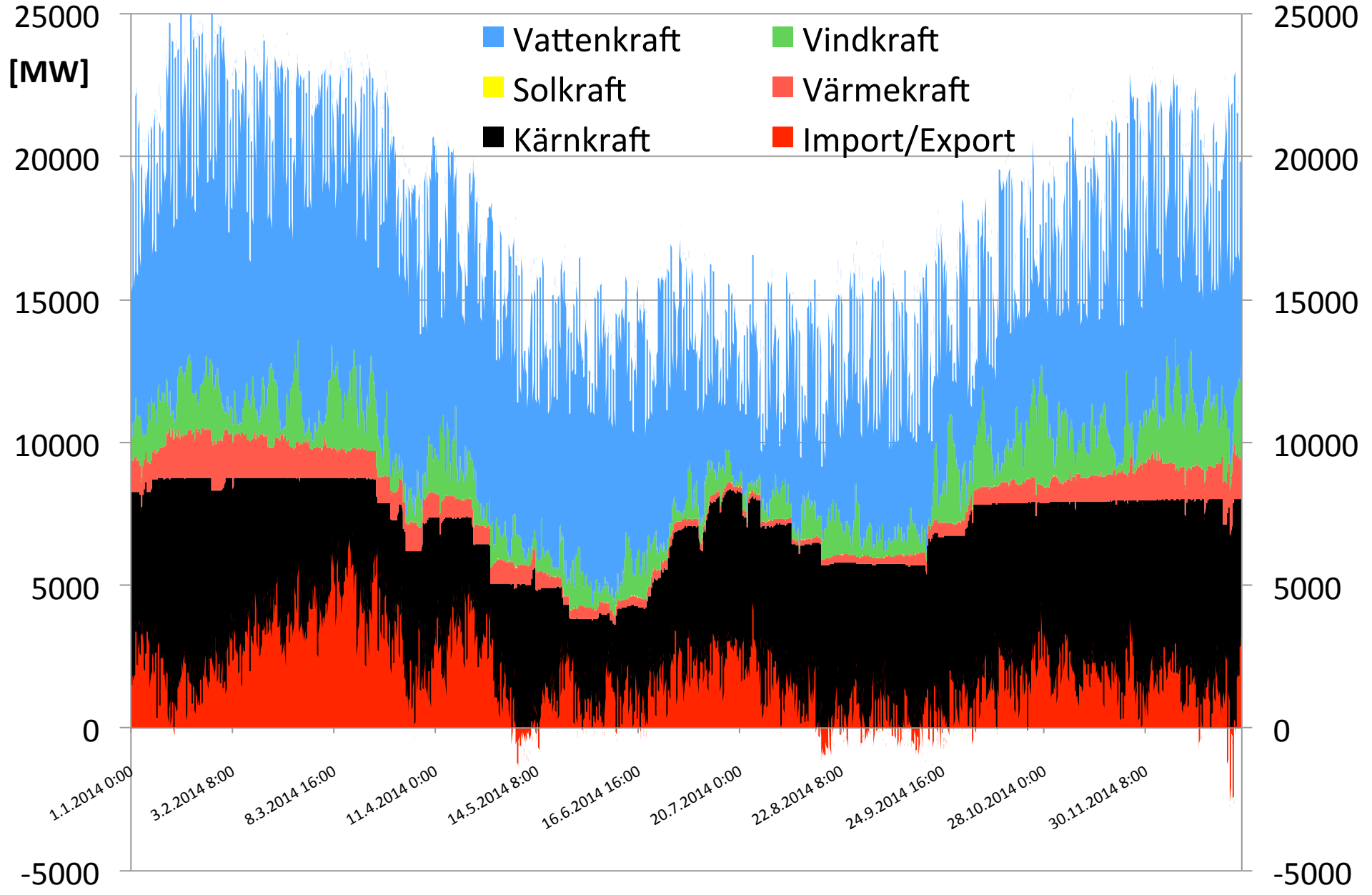
The following minutes: Hydropower is used to regulate the balance in the grid.

If there is not hydropower available, then gas is used. These are the plants that can most easily control the output.

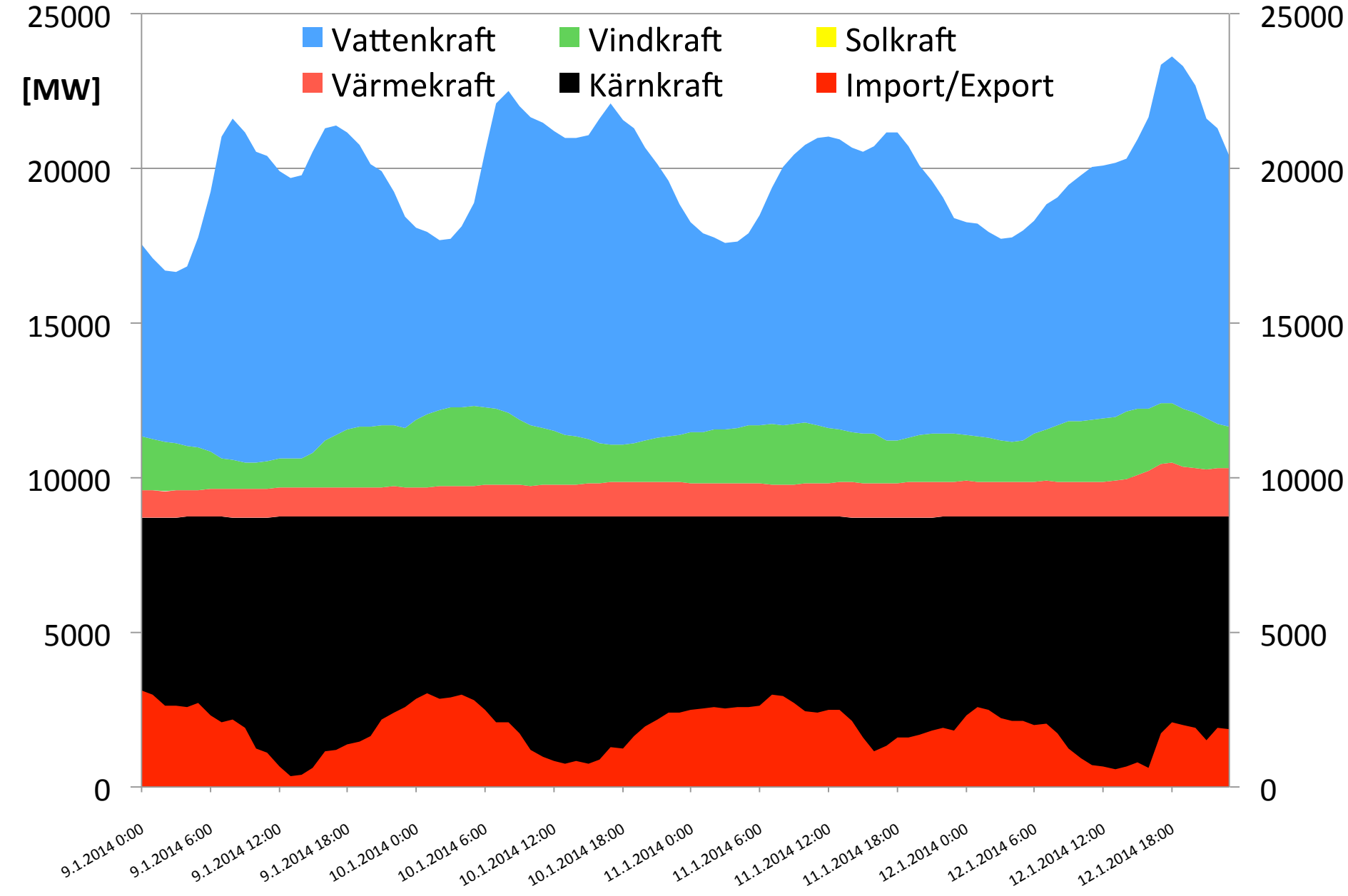
Electricity production in Sweden 2014

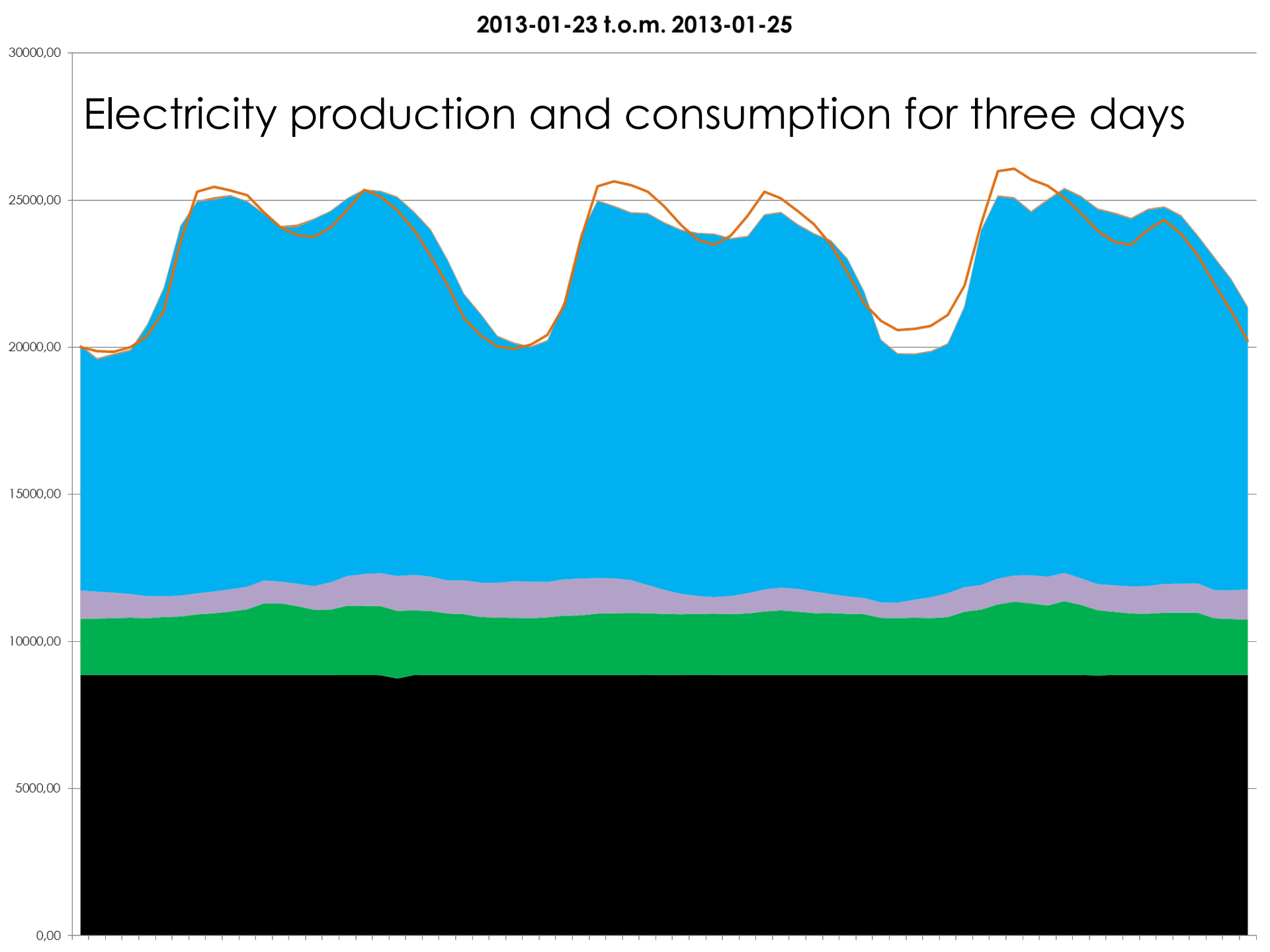


Electricity production in Sweden 2014



Electricity production in Sweden 9-12 Jan 2014




2013-01-23 t.o.m. 2013-01-25
Electricity production and consumption for three days
30000,00
25000,00
20000,00
15000,00
10000,00
5000,00
0,00

Electricity production in Germany in week 2 2017

usage tips

date selection

year:
2017
<< >>

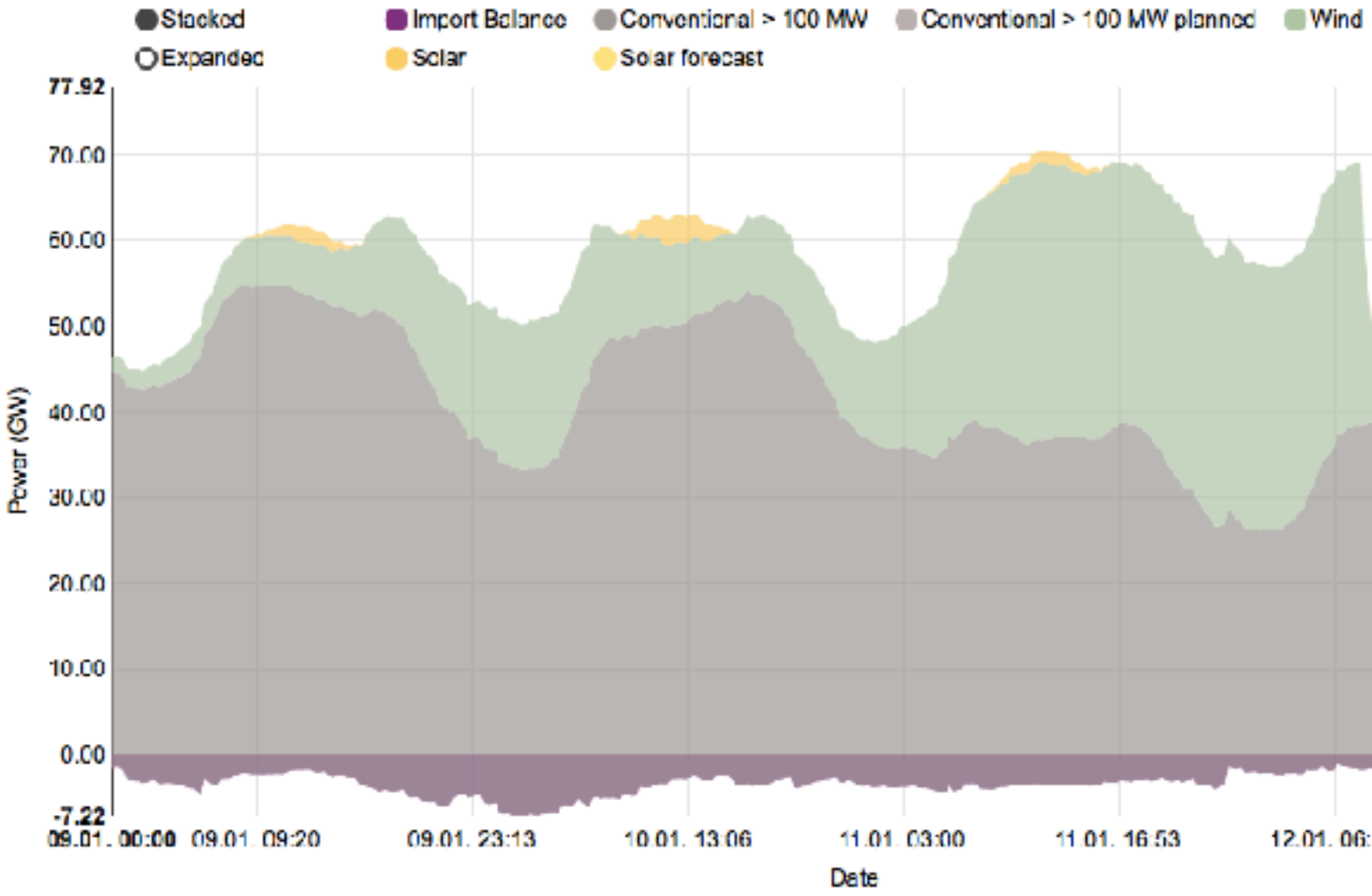
month:
<< >>

week:
2
<< >>

- conv. >100MW
- all sources
- solar, wind
- import, export

- run-of-river
- nuclear
- lignite
- lignite per unit
- hard coal
- oil
- gas

print



Net generation of power plants for public power supply
Datasource: 50 Hertz, Amprion, Tennet, TransnetBW, EEX
Last update: 12 Jan 2017 11:13

Electricity production in Germany in week 28 2016

usage tips

date selection

year: 2016 << >>

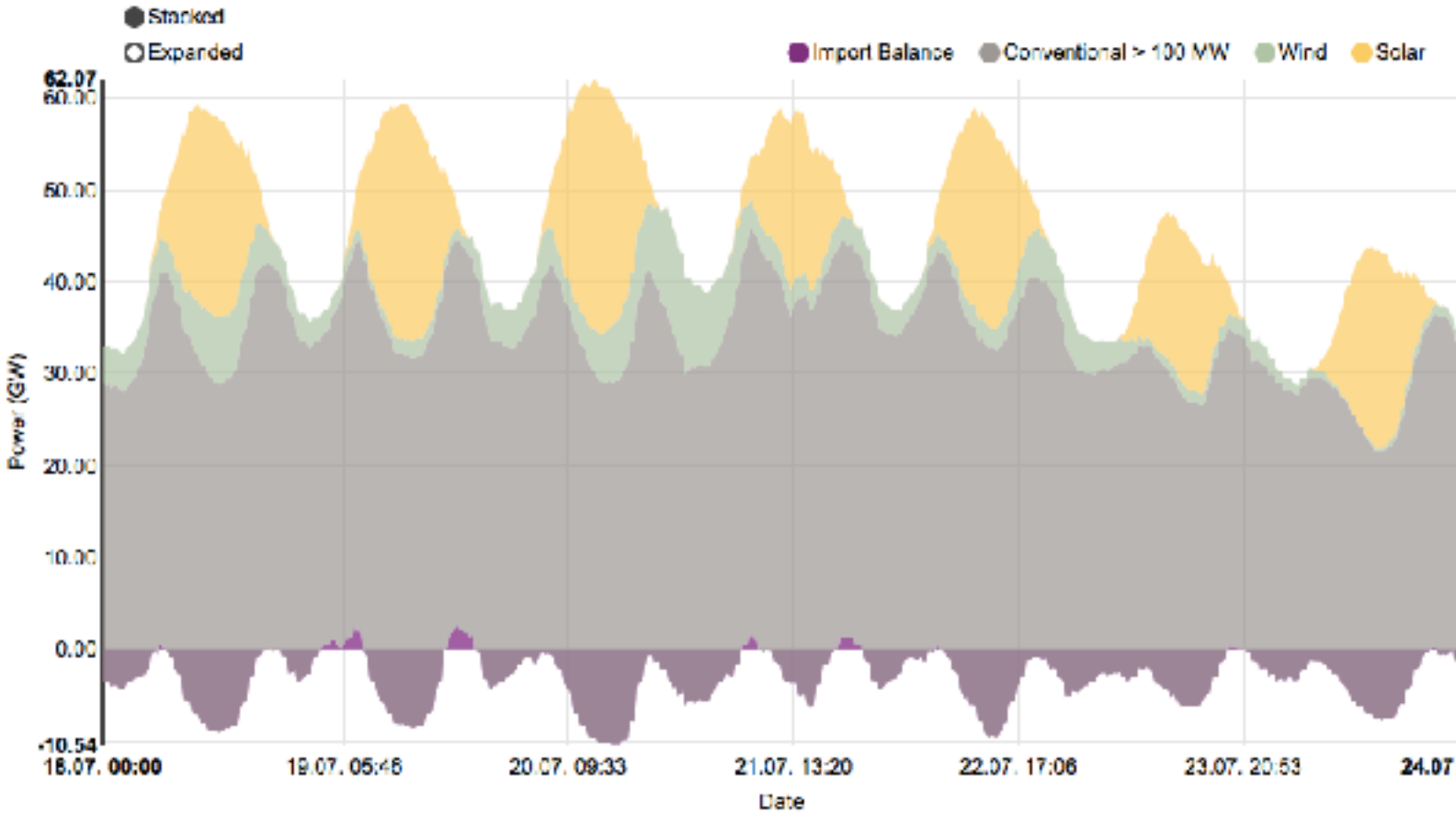
month: << >>

week: 28 << >>

- conv. >100MW
- all sources
- solar, wind
- import, export

- run-of-river
- nuclear
- lignite
- lignite per unit
- hard coal
- oil
- gas

print



Net generation of power plants for public power supply.

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